

Synthesis and Physiochemical Properties of 3-Propanenitrile Imidazolium - Based Dual Functionalized Ionic Liquids Incorporating Dioctyl Sulfosuccinate Anion

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Abstract : In the present work, a new series of 3-propanenitrile imidazolium-based Room Temperature Ionic Liquids (RTILs), incorporating dioctyl sulfosuccinate (DOSS) were prepared by reacting imidazole with acrylonitrile and then reacting the product with allyl chloride, 2-chloroethanol, and benzyl chloride. After the reaction had been completed, metathesis reaction was carried out using sodium dioctyl sulfosuccinate. The densities and viscosities of the present RTILs were measured at atmospheric pressure at $T=293.15$ to 353.15 K, the refractive index was measured at $T=293.15$ to 333.15 K, whereas, the start and decomposition temperatures were determined at heating rate $10^{\circ}\text{C} \cdot \text{min}^{-1}$. The thermal expansion coefficient, densities at a range of temperatures and pressures, molecular volume, molar refraction, standard entropy and the lattice energy of these RTILs were also estimated. The present RTILs showed higher densities, similar refractive indices, and higher viscosities compared to the other 1-alkyl-3-propanenitrile imidazolium-based RTILs. The densities of the present synthesized RTILs are lower compared to the other nitrile-functionalized ILs. These present RTILs showed a weak temperature dependence on the thermal expansion coefficients, $\alpha_p=5.0 \times 10^{-4}$ to $7.50 \times 10^{-4} \text{ K}^{-1}$. Empirical correlations were proposed to represent the present data on the physical properties. The lattice energy for the present RTILs was similar to other nitrile-based imidazolium RTILs. The present RTILs showed very high molar refraction when compared similar RTILs incorporating other anions.

Keywords : dioctyl sulfosuccinate, nitrile ILs, 3-propanenitrile, anion, room temperature ionic liquids, RTIL

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